

Supporting Information

for

Heteroatom-Tolerant Delamination of Layered

Zeolite Precursor Materials

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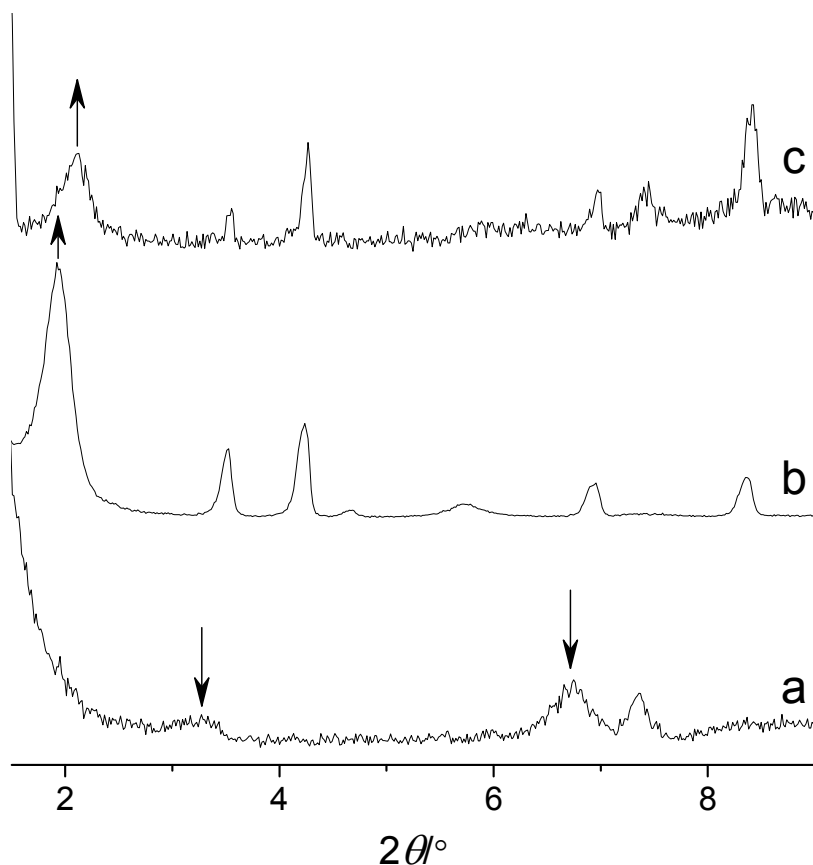


Figure S1. Powder X-ray diffraction patterns characterizing (a) as-made Al-SSZ-70, (b) swollen Al-SSZ-70, and (c) swollen B-SSZ-70. The downward arrows indicate the peaks representing lamellar structure of SSZ-70; these peaks disappeared after swelling of Al-SSZ-70 (b) and B-SSZ-70 (c) with concomitant appearance of peaks at lower angles that are indicated by upward arrows. The appearance of these peaks suggests intercalation of the surfactants between SSZ-70 layers. Other new peaks can be removed after washing away excess surfactants from the materials using either DMF or ethanol.

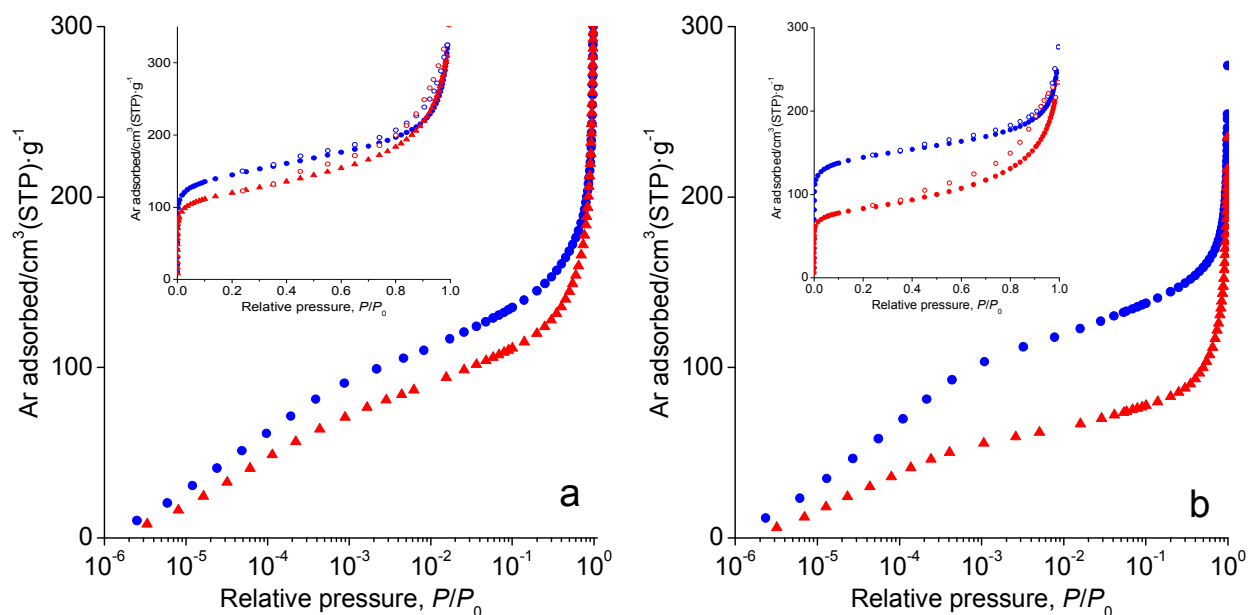


Figure S2. Argon gas adsorption-desorption isotherms characterizing the following calcined materials in a semi-logarithmic scale: panel a, (●) Al-SSZ-70 and (▲) UCB-3; panel b, (●) B-SSZ-70 and (▲) UCB-4. The inset in each panel shows the same data in a linear scale. The closed and open symbols in the insets represent the data in the adsorption and desorption branches, respectively.

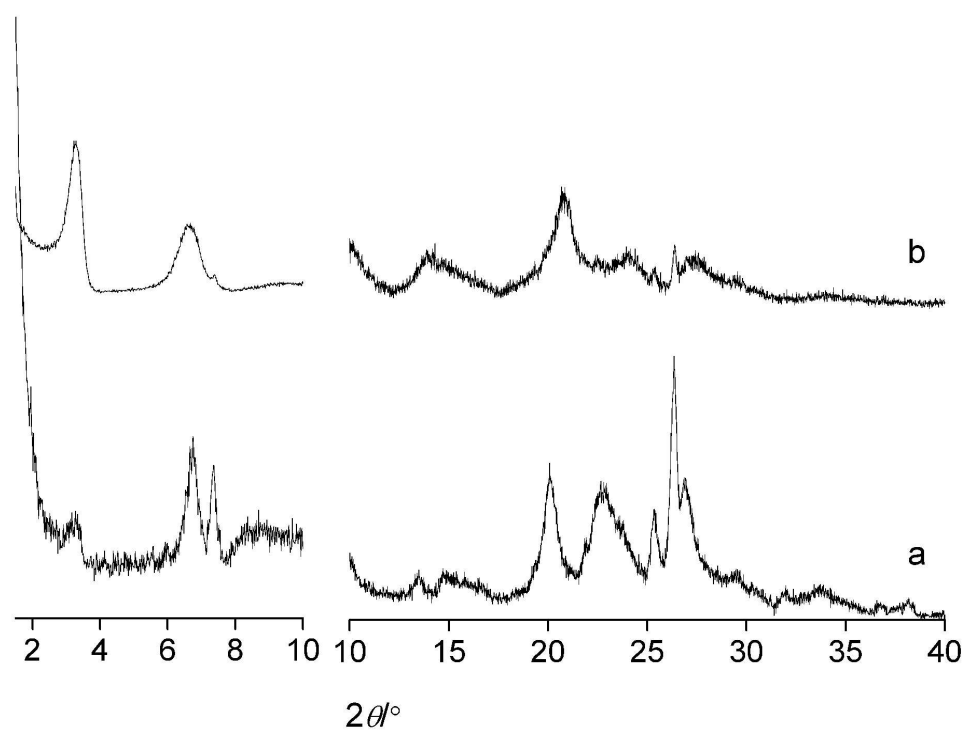


Figure S3. Powder XRD patterns characterizing (a) as-made B-SSZ-70 and (b) material formed by acidification of swollen B-SSZ-70.

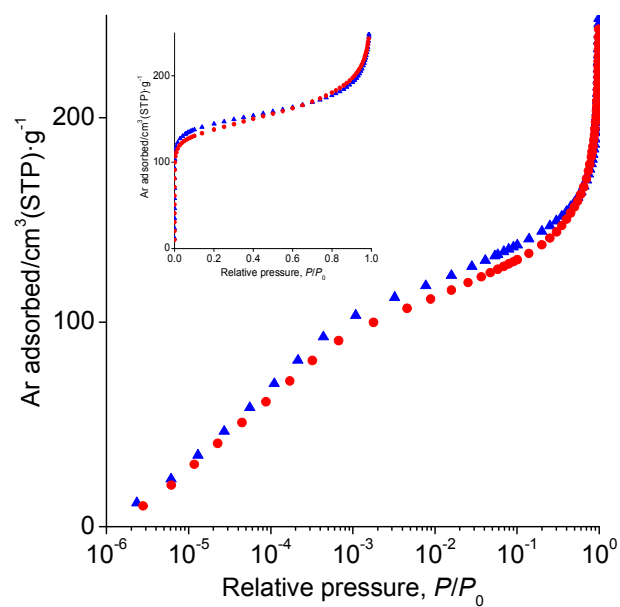


Figure S4. Argon gas adsorption isotherms characterizing the following calcined materials: (▲) B-SSZ-70 and (●) B-SSZ-70 that was swollen and acidified.

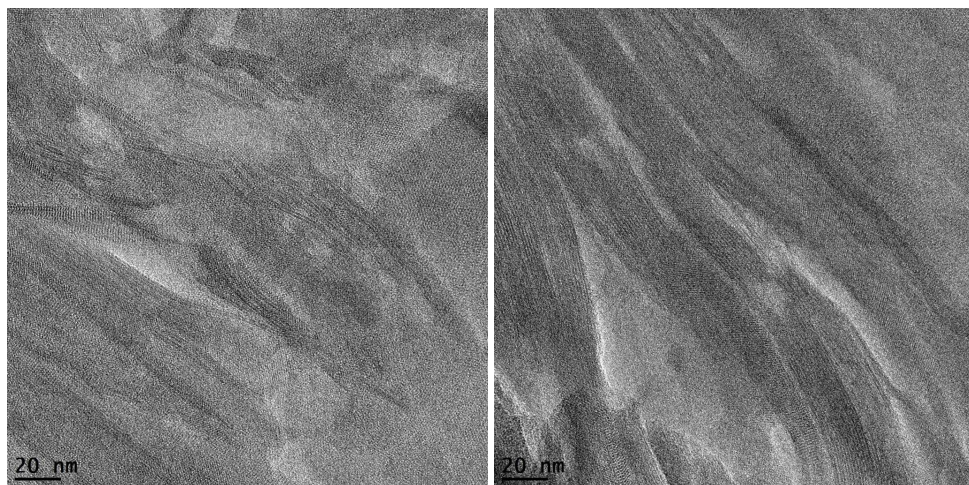


Figure S5. TEM images characterizing B-SSZ-70 that was swollen and subsequently acidified.

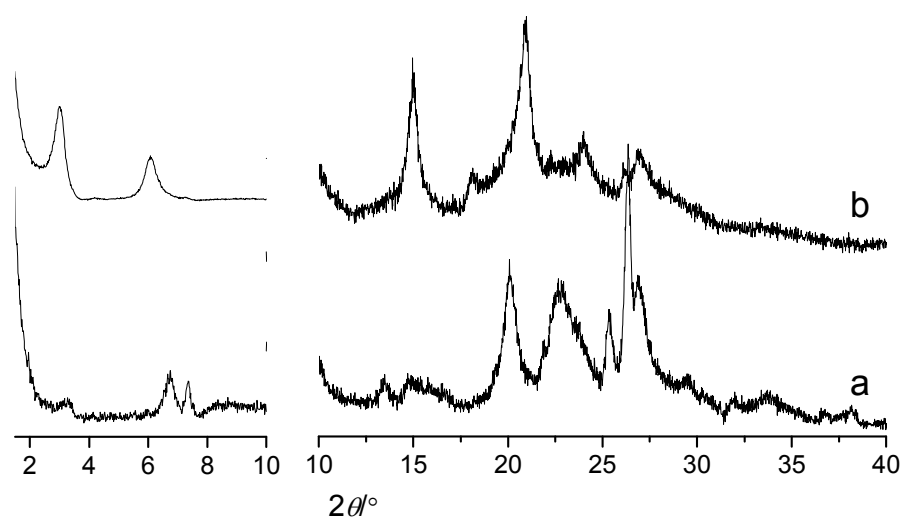


Figure S6. Powder XRD patterns characterizing (a) as-made Al-SSZ-70 and (b) material formed by acidification of swollen Al-SSZ-70.

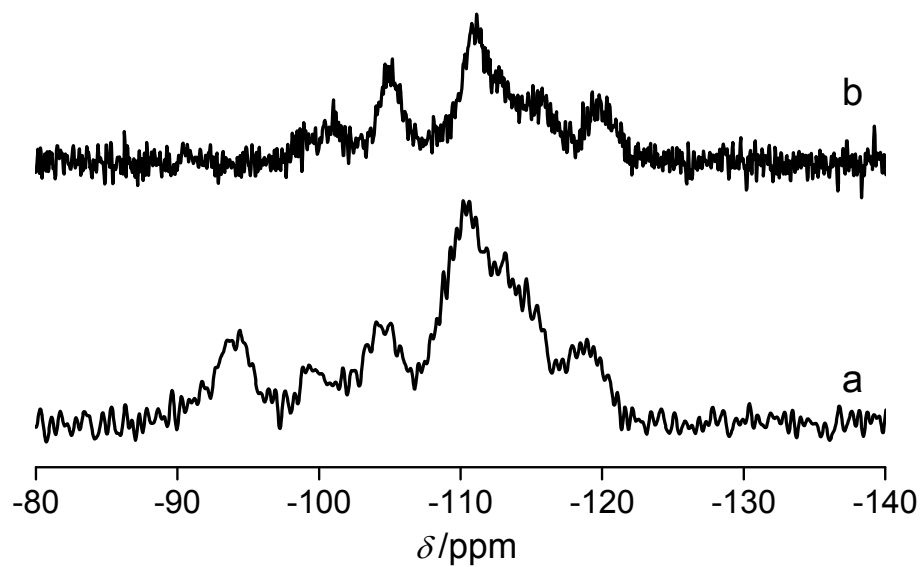


Figure S7. ^{29}Si MAS NMR spectra characterizing (a) as-made Al-SSZ-70 and (b) material formed by acidification of swollen Al-SSZ-70.

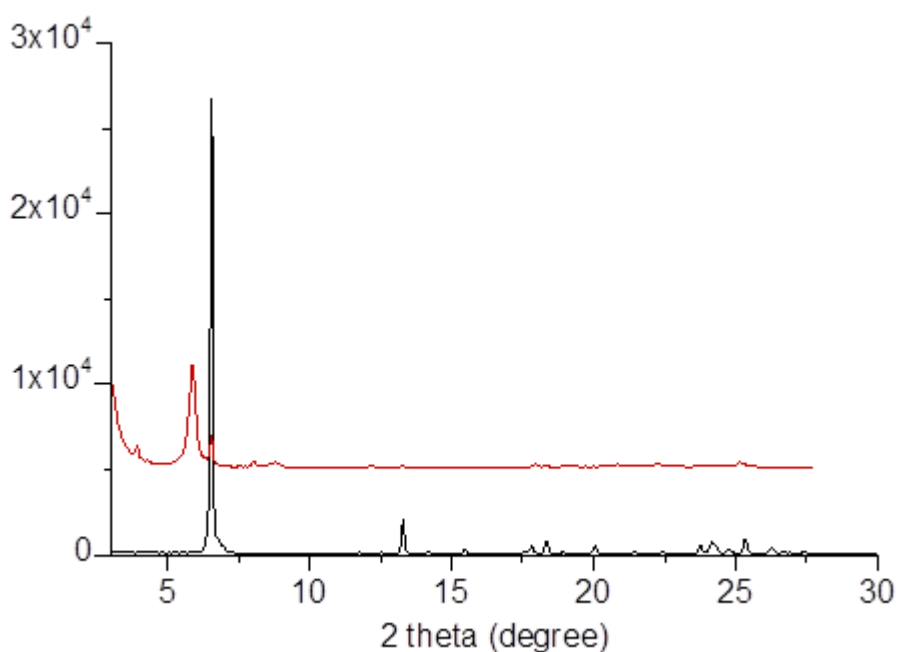


Figure S8. The layered structure of as-made Ti-PREFER samples, F229 is confirmed by the powder X-ray diffraction (PXRD) patterns shown above (bottom pattern). The prominent peaks corresponding to 200 ($2\theta = 6.6^\circ$, d spacing, 13.5 \AA) and 400 ($2\theta = 13.3^\circ$, d spacing, 6.7 \AA) planes within the lamellar structure are clearly present. After swelling treatment (top pattern), these 200 and 400 peaks almost disappeared, while several new sharp peaks emerge at low angles at 3.9° (d spacing, 22.5 \AA) and 5.9° (d spacing, 15.0 \AA), which are consistent with expanded layers inserted by CTAB surfactant. It also clearly shows that most of the peaks for as-made PREFER at high-angle region ($10 \sim 30^\circ$) disappear after swelling, only left with some weak and broad peaks. This confirms the loss of long-range order in PREFER crystals.

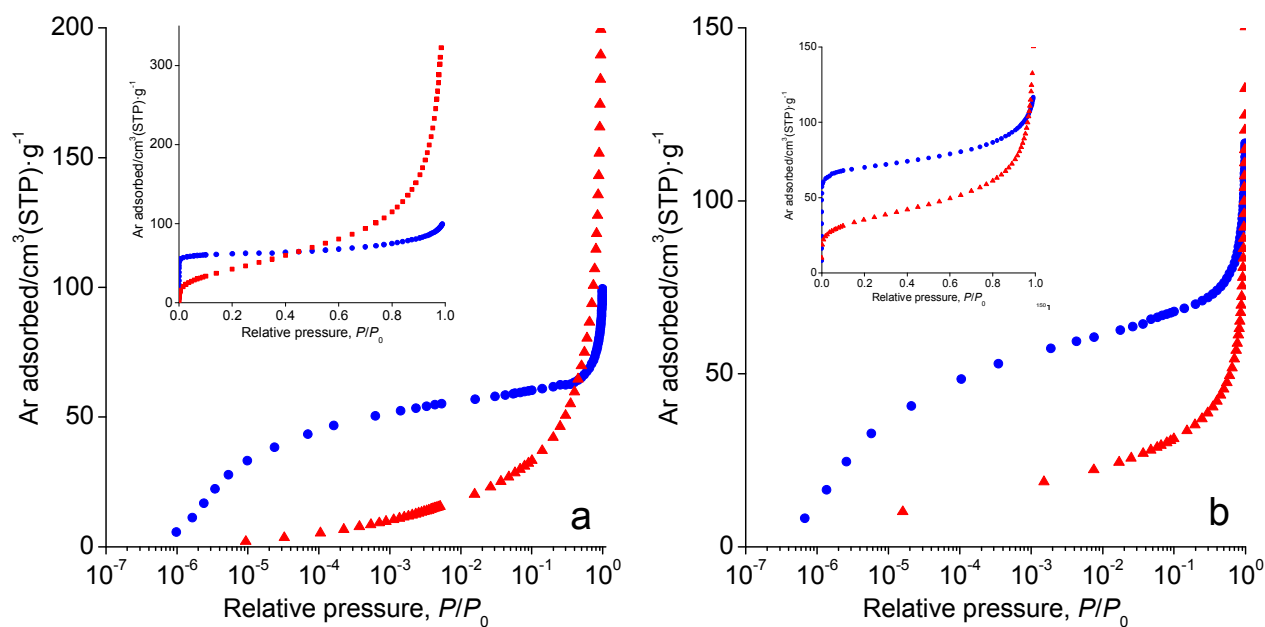


Figure S9. Argon gas adsorption isotherms characterizing calcined materials: panel a, (●) Al-PREFER and (▲) UCB-5; panel b, (●) Ti-PREFER and (▲) UCB-6. The insets show the data in the linear scale.

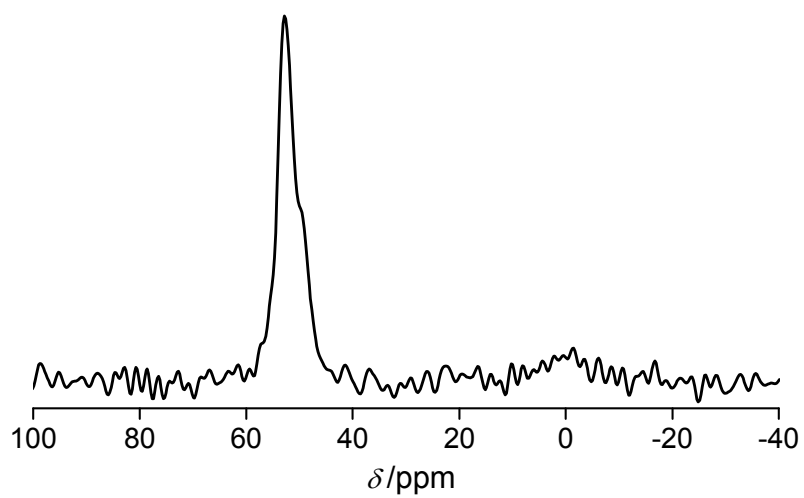


Figure S10. ^{27}Al MAS NMR spectrum characterizing as-made UCB-5.